

REMARKS/ARGUMENTS

Claims 1-13 are currently pending in this application, as amended. Of these, claims 1 and 3 have been amended and claims 5-14 have been withdrawn from consideration in response to the Restriction Requirement. Additionally, Figure 1 of the drawings has been amended and Figure 2 has been added. Amendments have also been made in the Specification at paragraphs [0003], [0010], [0025], [0028], [0038], [0038.1], [0040], [0041], [0043], [0050], [0051], [0052], [0055] and [0057]. Further, the list of reference numbers of page 12 of the Substitute Specification was also amended. Applicants submit that no new matter has been introduced into the application by these amendments.

DRAWINGS

In the Action, the drawings were objected to as not showing every feature of the invention specified in the claims. Specifically, it was noted that the drawing did not show detail of the crankshaft trigger wheel, detail of the triple shaft gearbox including its connections to other components, and the three phase motor have Halls sensors installed therein.

In response, Applicants have amended Figure 1 of the drawings in order to schematically illustrate the crankshaft trigger wheel in Figure 1 and added Figure 2 to show the details of a three phase motor having Halls sensors installed therein by showing a prior art BLBC three phase motor having Halls sensors. With respect to the triple shaft gearbox, this is indicated at 1 in Figure 1 and the connections to the crankshaft, the camshaft and the motor are shown. As the specific type of triple shaft gear box is not being claimed, it is submitted that the box diagram illustrated in Figure 1 is sufficient to show the features and connections as recited in the claims.

In view of these amendments, withdrawal of the objections to the drawings is respectfully requested.

CLAIM OBJECTIONS

Claim 1 was objected to in the Action which notes that there is only a single camshaft regulator that is being recited in the claims. Applicants have amended claim 1 to address this so that a single camshaft regulator is referred to. Accordingly, withdrawal of the objection to claim 1 is respectfully requested.

CLAIM REJECTIONS – 35 U.S.C. §112

Claims 3 and 4 were rejected under 35 U.S.C. §112, second paragraph, as indefinite. The Action notes a minor formality with respect to claim 3 which has been amended as suggested. Accordingly, withdrawal of the Section 112 rejection of claims 3 and 4 is respectfully requested.

CLAIM REJECTIONS – 35 U.S.C. §102

Claims 1-3 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. 6,129,061 to Okuda et al. Applicants respectfully traverse this rejection.

Claim 1 is directed to a device for determining an angle of rotation between a camshaft and a crankshaft of an internal combustion engine. The device comprises a camshaft regulator and means for determining the angle of rotation position of the camshaft and the crankshaft including a crankshaft trigger wheel with reference and trigger marks fixed to the crankshaft for determining the angle of rotation position of the crankshaft and a triple shaft gearbox having a first shaft that is locked in rotation with the camshaft, a second shaft that is connected via a camshaft driving wheel to the crankshaft, and a third shaft as a regulating shaft that is connected to a permanent magnet rotor of a BLDC motor. The BLDC motor has a housing-fixed stator and an electronic commutation, which is controlled through commutation signals, which are used simultaneously for determining an angle of rotation position of the camshaft and together with signals of the

crankshaft trigger wheel for calculating the angle of rotation $\Delta\phi$ between the camshaft and the crankshaft.

While the Action cites Okuda et al. as disclosing such a device, it is clear upon review of this reference that this is not the case. Okuda et al. discloses a camshaft adjusting device having an electric motor connected to the regulating shaft; however, as shown in Figure 1 and described in detail at column 6, line 59 – column 7, line 3, the angle of rotation $\Delta\phi$ between the camshaft and the crankshaft is calculated using two position sensors (41, 42). The crank angle sensor (41) detects the crank angle and the cam angle sensor (42) detects the cam angle, and these two sensors both feed signals to the ECU (40) in order to obtain $\Delta\phi$ between the camshaft and the crankshaft. In the next embodiment of Okuda et al. referenced in the Action, shown in Figure 12 and discussed at column 11, line 64 to column 12, line 9, the electric motor is disclosed as having three Hall elements which detect the magnetic poles of the permanent magnets which rotate together with the rotor. However, these are only used to determine the rotation angle of the rotor (133) of the motor. There is no suggestion or disclosure of using the Hall element signals or commutation signals for the BLDC motor for determining an angle of rotation position of the camshaft and together with signals of the crankshaft trigger wheel calculating the angle of rotation $\Delta\phi$ between the camshaft and the crankshaft. It appears clear based on the earlier teaching that Okuda et al. relies on a separate cam angle sensor (42) and does not calculate $\Delta\phi$ based on any commutation signal of the electric motor connected to the regulating shaft of a triple shaft gearbox. Accordingly, claim 1 cannot be anticipated by Okuda et al.

Claims 2 and 3 depend from claim 1 and should be similarly patentable over this reference.

Claim 4 was rejected under 35 U.S.C. §103 as unpatentable over the combination of Okuda et al. and U.S. 6,681,741 to Majima et al. Majima et al. is cited as a secondary reference to Okuda et al. for the teaching of a method of monitoring the rotation of the camshaft and crankshaft where a RAM or an EPROM

are provided in order to store and/or make detectable information in stand still or during startup of the internal combustion engine. However, this reference does not address the above-noted deficiencies with respect to Okuda et al. Further, while Majima et al. discusses the ECU (80) as including a memory for storing predetermined control programs and temporarily storing data, there is no suggestion in this reference of the RAM or EPROM that stores or makes detectable counts and thus a position of the camshaft in stand still or during startup of the internal combustion engine. Accordingly, withdrawal of the Section 103 rejection of claim 4 is respectfully requested.

CONCLUSION

If the Examiner believes that any additional minor formal matters need to be addressed in order to place the present application in condition for allowance, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience, in order to resolve any such matters.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the present application, including claims 1-4, is in condition for allowance, and a Notice to that effect is respectfully requested.

Respectfully submitted,

Schäfer et al.

By:____/Randolph J. Huis/____
Randolph J. Huis
Registration No. 34,626
(215) 568-6400

Volpe and Koenig, P.C.
United Plaza, Suite 1600
30 South 17th Street
Philadelphia, PA 19103
RJH/dmm